WHAT IS CLAIMED

1. Apparatus and process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, and in which deuterium flows out of an electrically polarized solid-electrolyte layer into a metal reactor plate, and in which deuterium flows out of the metal plate into a second polarized solid-electrolyte layer, with the reactor plate containing one or more diffusion-impeding non-metallic layered inclusions.

2. The apparatus and process of Claim 1 in which at least one diffusion-impeding layer is made of CaO.

3. The apparatus and process of Claim 1 in which the non-metallic inclusions are made of salt-like crystallites of metal halide or metal oxide.

4. The apparatus and process of Claim 1 in which the metal reactor plate is made of metal selected from a group comprising Pd or Pd alloy.

5. The apparatus and process of Claim 1 in which the solid-electrolyte layers are made of poly ethylene oxide (PEO), containing deuterided phosphoric acid.

6. The apparatus and process of Claim 1 in which process flow direction alternates in response to changes in potentials applied across the solid electrolyte layers.

7. Apparatus and process process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, and in which deuterium gas flows from a deuterium gas reservoir into and through an input electrolysis cell containing a solid electrolyte layer interfaced with a metal reactor plate, from which reactor plate deuterium flows out of the outflow surface of the reactor plate into the deuterium gas reservoir, thereby completing a gas circulation loop, with the reactor plate containing at least one diffusion-impeding non-metallic layered inclusions.

8. Apparatus and process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, and in which deuterium gas is adsorbed onto the inflow surface of a metal reactor plate, from which reactor plate deuterium flows out of the outflow surface of the reactor plate into an electrically polarized solid-electrolyte layer, with the reactor plate containing at least one diffusion-impeding non-metallic layered inclusions.

9. Apparatus and process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, with the apparatus including a reservoir enclosure filled with anhydrous, carbon-free D_2 gas and containing a metal reactor plate, with the gas-filled reservoir enclosure and the reactor plate being segments of a closed-loop circulation path in which deuterium flows out of the gas reservoir onto and through a non-porous inflow metal foil, through an electrically polarized solid-electrolyte layer, onto the non-porous inflow surface of the metal reactor plate, passes through the reactor plate by permeation flow driven by a drop in deuterium chemical potential between the inflow and outflow surfaces of the reactor plate, into a second polarized solid-electrolyte layer, and out through a non-porous outflow metal foil into the gas reservoir enclosure, with the gas reservoir enclosure containing a filling tube by which the process operator can admit D_2 gas into the reservoir, and containing separate electrical leads by which the operator can apply independent voltage potentials across the inflow and outflow solid-electrolyte layers, with the reactor plate containing a dispersion of diffusion-impeding ionic solid crystallite inclusions within its interior volume, with the inflow and outflow foils and the reactor plate containing hydrogen-permeable metal, and with the edges of the 2 electrochemical cells and the permeation plate reactor being coated with a non-porous insulating material.

10. The apparatus and process of Claim 9 in which the ionic solid crystallite inclusions are made of CaO.

11. The apparatus and process of Claim 9 in which the ionic solid crystallite inclusions are made of salt-like crystallites of metal halide or metal oxide.

12. The apparatus and process of Claim 9 in which the non-metallic inclusions consist of metal oxides selected from a group comprising magnesium oxide, cesium oxide, strontium oxide, lithium oxide, beryllium oxide, boron oxide, zirconium oxide, nickel oxide, iron oxide, vanadium oxide, and titanium oxide.

13. The apparatus and process of Claim 9 in which the metal reactor plate is made of metal selected from a group comprising Pd and Pd alloy.

14 The apparatus and process of Claim 9 in which the solid-electrolyte layers are made of poly ethylene oxide (PEO), containing deuterided phosphoric acid.

15. The apparatus and process of Claim 9 in which the solid-electrolyte layer is made of a non-metal selected from a group comprising alkali metal deuteroxides, alkali metal oxides, and alkali metal hydroxides, or a mixture thereof.

16. The apparatus and process of Claim 9 the process flow direction alternates in response to changes in potentials applied across the solid-electrolyte layers.

17. Apparatus and process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, and in which deuterium gas flows from a deuterium gas reservoir into and through an input electrolysis cell containing a solid electrolyte layer interfaced with a metal reactor plate, from which reactor plate deuterium flows out of the outflow surface of the reactor plate into the deuterium gas reservoir, thereby

completing a gas circulation loop, with the reactor plate containing a dispersion of diffusion-impeding non-metallic inclusions.

18. The apparatus and process of Claim 17 in which the non-metallic inclusions are made of CaO.

19. The apparatus and process of Claim 17 in which the metal reactor plate is made of metal selected from a group comprising Pd or Pd alloy.

20. Apparatus and process for generating heat by exothermic nuclear reactions in which reactions deuterium participates, and in which deuterium gas is adsorbed onto the inflow surface of a metal reactor plate, from the reactor plate deuterium flows out of the outflow surface of the reactor plate into an electrically polarized solid-electrolyte layer, with the reactor plate containing a dispersion of diffusion-impeding non-metallic inclusions.